The Flora of Lower Siam.

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The political kingdom of Siam may be said to consist of two parts, the larger or Siam proper, Long. 100-105; Lat. 12-15, lying North and West of Cambodia, and South of Laos and the Shan States, the smaller or Lower Siam consisting of a Peninsula Lat. 12-6 connecting Burmah with the Malay Peninsula. The upper part of this Peninsula is the province of Tenasserim which runs down the West coast to Victoria point. This country has been botanically explored by Wallich, Griffith and later botanists as has the Mergui archipelago lying to the West, and the flora is incorporated in the flora of British India; of the Southern and Siamese portion from the isthmus of Kra southwards comparatively little has been known till recently. The Flora is quite distinct from that of the Malay Peninsula and it was to find the boundary line between these two floras that I visited Alor Star, Perlis and Setul in March 1910, and made a good collection of plants. I found that the boundary line lay about Alor Star, and propose in this paper to put together an account of the plants of this Peninsula from this point as far North as Renong. Some years ago I made an expedition to Kedah Peak expecting to find there the Siamese flora represented but the flora was strictly Malayan. This mountain, and I am informed Gunong Perak also, are granite, and the termination of the granite chain of the Malay Peninsula. Gunong Perak has not been visited by any botanists as yet, but it will probably be found to bear also a Malayan flora. At Alor Star there is a complete change of flora, accompanied by the replacing of the granite by sandstone rocks, and a change of limestone hills ending at Perlis, except for a few scattered blocks such as Gunong Geriang, near Alor Star. These sandstone and limestone hills and ridges rise out of flat plains largely occupied by ricefields and quite unlike the country in the South of the Peninsula. The climate too alters considerably here, the dry season being much more marked. During this season many of the trees become leafless, and many herbaceous plants wither up and disappear above ground, specially on the limestone rocks. At the time of my visit to Alor Star the ricefields were very dry and many plants quite dried up, so that these fields had the appearance of the English grass fields in late autumn. There had been apparently more rain at Perlis and Setul and many of the ricefield herbs which at Alor Star were withered up, were still in flower there.

With these changes of soil and climate I found a great change with the flora, the absence of very many common Malay genera and species, and a great increase in Indian and Burmese plants.

Very striking, too, was the great preponderance of Xerophytic plants, and a corresponding diminution in strictly hygrophytic species. The conspicuous spiny and thorny character of a large proportion of species shewed how strictly xerophytic the flora had become. In order to get a clear idea of this distinct flora, I propose to record in the list of the plants all the species I can find noted or collected in the whole of this district, including the adjacent islands of the Lankawi Archipelago.

The East Coast of the Peninsula as far as this has not yet been botanically explored, so that it is not certain where the boundary line between the two floras lies on this side. Such plants as I have obtained from Kelantan and Legeh are nearly all typical Malayan, so that the boundary line is somewhere North of that State.

Collectors.—The earliest Collector in the region included in our area was Koenig in his travels to Bangkok and back from India (Journal of the Royal Asiatic Society, xxvi, p. 195). On the return voyage March 16, 1779, he arrived at the Lankawi islands, and there northwards to "Pulu Salang," or Junkseylon as it was called in those days. He collected here from March 20 to 28, when his ship left for the Nicobars. I have but few records however of what he collected here. Kunstler, collecting for Sir George King, visited and collected in Trang, and a number also of his plants are issued as from Quedah, (Kedah), but as no special locality is given and the plants mostly have the appearance of having come from south of Alor Sta, I have omitted most from the list. Mr. C. Curtis of the Penang gardens explored much in this region, making very extensive collections in the Lankawi archipelago, including the outstanding Island of Terutau, and on the mainland at Pungah (Pngah), Kasum Tongkah and Puket in Junkseylon, Kopah, and Trang. Mr. Fox visited Kopah, and native collectors have brought plants from several localities on this coast. Mr. Kloss kindly took a native botanical collector to Chong in Trang last year, who brought down a small collection. Mr. St. V. B. Down has collected a few plants of interest in Singora and other spots in this region, and Mr. C. Goldham some from Trang, Tongka, etc.

Tongka and Renong have long been known as great collecting grounds by the orchid dealers.

In 1890-1891, Dr. Keith who was stationed at Bangtaphan on the East Coast, made an excellent collection of the flora there and at Bangtaphanoi. His collections with very complete notes and sketches of structure of the flowers is preserved in the herbarium of the Singapore Botanic Gardens.

With these collections and the plants obtained in the expedition this year Feb.—March, 1910, to Kedah, Perlis and Setul, we have a very fair idea of the flora of this region though much yet remains to be done in the mountains of the interior and on the East Coast.

Of the neighbouring countries which might throw light on the questions of distribution aud origin of this flora, Tenasserim was explored by Parish and others; the Mergui archipelago by Griffith.

Siam proper has not been yet adequately explored, a few small collections have been made but little has as yet been published. French Indo China has been better investigated.

The Nicobar Islands, the flora of which has much in common with this region, have been explored by Kurz, and the plants are described in the materials for a flora of the Malay Peninsula and elsewhere.

Bangtaphan.—The plants recorded in this list from Bangtaphan and Bangtaphanoi were collected by Dr. A. Keith in 1890 and 1891, when he was stationed at the mines in that District. The locality is on the East coast of the Peninsula with a latitude of 11-15 N. . . . . An account of this country was published by him in the Journal of the Straits branch of the Royal Asiatic Society, No. 24. p. 63, 1892). The main range of this country, running from Tenasserim to Pakchan is a rough grain granite, flanked on the sea side by metamorphosed clay slate and a great bed of conglomerate rock. The hills skirting the sea and Islands are limestone. Kawi and Bangtaphan are covered with forest which ceases at Bangtaphanoi, and thence to Pateeo is a big area of lalang grass, sixty square miles in extent. This, according to tradition, was due to a typhoon which, 27 years before Dr. Keith wrote, levelled the forest, and a fire which followed left an open country soon covered by grass; fires still continuing reduced the jungle that remained further. The rainfall at Bangtaphan in 1890 was only 63 inches, while at Mergui further North and a higher latitude it was 200 inches, thus it is probable that this East coast is drier generally then the West coast.

The collection that Dr. Keith made is a most valuable one, as nothing has been previously done in this region south of Tenasserim where Parish worked, so that his collections fill the blank between Burmah and the Malay peninsula to an important extent. In a letter dated May 28, 1890, he describes the different forms of the flora he had noted thus.

" Were I asked to group the vegetation here into its different varieties, I would distinguish:

1. That which is due to man's influence and interference.
2. That which maintains its ancient integrity.

Of No. 1, I may say that the herbaceous plants and sunlight plants, shrubs and small trees thrive, and here is the greatest struggle for existence.

Its subdivisions can be characterised by its variety of plants.

a. Orchards and uncultivated lands round houses and villages. Fruit trees abound, Orange, Lime, Pumelo, Mango, Banana, Coconut, Betelnut, Sugar palms, etc. The under vegetation is rich, many phanerogams and medical plants, and certain weeds etc.

b. Paddy fields and their outskirts, many grasses, waterweeds, Scrophulariaceae etc.

c. Old Paddy fields now used as pasture afford Malvaceae, small trees, etc.

d. Bamboo jungle ; some old dry paddy fields, sometimes from cutting down of jungle, sometimes from burning jungle. Trees here and there, and although there is a ground vegetation poor and few species.

e. Jungle cut down and kept cut down, rather a peculiar lot of convolvuli, grasses, thorny weeds coming up with other shrubs (many *Euphorbiaceae.*)

2. Natural vegetation.

a. That between the high water mark and the edge of the jungle. Creeping plants, convolvulus, Leguminosae, grasses screwpines *(Pandanus)* and other shrubby trees.

b. Mangrove swamps.

c. Banks and Islands of the streams.

d. The jungle-forest of the plains.

e. Hill forest of a shrubby stunted nature but no ground carpeting vegetation."

(The limestone hill flora he had not examined when he wrote this. It would form another class.)

"These different divisions I look upon as containing vegetation of different eras. The oldest vegetation is that of the hills, the sea beach and mangrove follow, then those of the stream and plain. That of the stream I look upon as most important. It is the earliest and only open vegetation in nature in such a place as this. When a flood comes tearing down, it clears 3-4 yards on each side of its banks and leaves a slimy top dressing with no doubt many seeds from elsewhere.

The vegetation that succeeds a crop of paddy has no more resemblance to that which preceded the paddy than the crop of weeds that succeeds the corn on the hillside has to the heather. In those spaces one often finds plants and yet nowhere around are others (of the same kind) to be seen. Where the seeds come from I cannot tell.'

In an other letter he refers to the flowering seasons of the different plants. "The Globbas commence to flower here in May and flower into September. The *Malvaceae* season commences two months later and also ends about two months later. The orchids commence to flower about April."

In Alor Stain the end of February I found the ricefield vegetation much dried up, *Xyris indica* was perished to the root, leaves and scapes brown and rotten, *Geissaspis* was quite over too as were many of the smaller ricefield plants, but on reaching Perlis we found the *Geissaspis*, *Smithia* and most of the ricefield weeds in good flower. (*Xyris indica* however was dead) Kanga, where I collected, however, is closer to the long range of limestone hills and there was obviously more rain there, or to be accurate the rainy season lasted longer. The same thing might be said of Setul where we found a little *Xyris indica* not over. *Lagerstroemia floribunda* was still in flower at Alor Sta but pretty well over in Setul. The native collector with Mr. Kloss collected it in flower at Chong in Trang in December.)

Tongkah. The following account of a botanical excursion to Kasum and Pungah by Mr. Curtis in 1896 was published in a Garden Report the following year. As this Report is now scarce and the account possesses some interest, I reprint it here.

"I left Penang in the S.S. *Petrel*, which is at present the only steamer trading between this port and Tongkah, on the afternoon of the 9th November, and arrived there the following day, the voyage occupying about 23 hours. There was very heavy rain during the night on the way up, and I began to fear that I had undertaken the trip too early in the season, but fortunately my fears proved to be groundless for I had fairly dry weather all the fortnight I was away. On arrival in Tongkah, I called on Prah NANISON, the Acting Chief Commissioner, expecting to get the use of the steamlaunch to go to Kasum, but unfortunately the launch, like pretty well everything else in all the places I visited, is sadly out of repair and cannot be used. He, however, kindly offered me the loan of a boat, and promised to have it ready the following morning, and also furnished me with letters to the Governors of Kasum and Pongah. At this season the wind is unfavourable for getting from Tongkah to the places I wished to visit, and unfortunately the mast of the Commissioner's best boat snapped at the foot before we had been an hour under sail, so that we had a long row into Pulau Sirih for repairs, where we remained all night.

On the second day we tacked about without making much progress untill 5 p.m., when we landed on Pulau Panjang to do some cooking, and while this was being done I collected a few plants. *Cirrhopetalum medusæ* appeared to be abundant on rocks in this island. At 6-30 p.m., we started again with a fresh breeze standing straight across for the picturesque islands near the entrance to the Kasum River under shelter of one of which, Pulau Prabat, we anchored until 5 a.m., when we got under way again. At 7 a.m., we landed on a small island to cook and collect plants; the most interesting kinds found here being two species of begonia and two of pogonia, the native name of one of the latter being "elephant ear." From this place we proceeded slowly against wind and tide to Kasum which was reached between 3 and 4 p.m., so that I had actually been about 49 hours from Tongkah.

The scenery among the islands before entering the Kasum River is magnificent, scores of islands of the most fantastic forms rising abruptly from the sea to a height of several hundred feet. Similar scenery may be seen in Langkawi, but on a much reduced scale. On arrival in Kasum I sent my letters of introduction to the Governor with a request for an empty house if possible. In a short time I received a message that the Governor was suffering from fever and would not be able to see me for two or three days, but a house was being prepared for me. This was the one decent looking house in the village, originally intended, I was told, for a Post Office; but as soon as the men commenced cleaning it out it was found to be unsafe, so I had to go into a Chinese attap house in the main and only street. For a place of its size, and it is a village of about 100 houses, and perhaps 700-800 inhabitants, Kasum is the most miserable looking place I ever set eyes on. The main street is overgrown with weeds and in places knee deep in mud. On either side are tall bamboo leaning at all angles with the remnants of banners dangling in the breeze, the remains of the decorations of some religious festival long past. The houses are of plank and attaps with very sharply pitched roof and a sort of covered five-foot way in front, but it is only in places that one can cross from one side of the street to the other without sticking in the mud. A few days' residence in this place has a most depressing effect. The morning after arrival, I collected orchids, &c. along a road that was commenced 3 or 4 years ago and cut for a distance of about 4 miles to a place called Wattam, where there is a Bhuddist Temple in a cave in the limestone rock with numerous figures rapidly going to decay. One of the figures in a reclining position is about 45 feet long. I spent some time in botanizing on this hill and collected several interesting plants. One of the priests showed me a plant of *Dendrobium Farmerii* fastened on a block of wood, which he assured me was very rare, and, so far as my experience goes, it is so, for I only collected two plants of it during the time I was there.

When the road to this place was commenced it was intended to carry it on to Pongah and fine hard-wood beams were brought in for bridging the streams and posts for telegraph wires. The wires were never put up and the beams are lying alongside the streams rotting.

On the second day, the Governor sent me a man who spoke Malay to accompany me anywhere I wished to go and to assist me generally. Two days I went down the river to the limestone hills, and on another day walked across to Pongah and slept there, returning by another route the following day. The distance I estimate to be about 10 or 12 miles. Pongah is not so nice a place as it was in the old Raja's time, things are fast going to decay. The road from the landing which he planted up with shady trees and kept in good order is now almost impassable in places, and the building in which I stayed on a previous visit, and was most hospitably entertained, leaks like a sieve, and as it rained the night I was there it was difficult to find a dry spot. It is interesting to note that several natives have a few orchids growing around their houses and one has quite an interesting little collection, and this, they told me, was the result of my previous visit. *Dendrobium Farmerii* is evidently the kind they prize most, and shows good taste on their part, but it is scarce, and they set a value on them that prevented me from buying. This is abundant in Mergui, and Pongah is apparently about its southern limit. One very interesting *dendrobium* I saw in a garden which I was most anxious to get, but the owner would not part; he, however, gave some flowers to dry which will, I hope, be sufficient for determination, but I have little doubt it is an undescribed species. On the limestone islands I collected a great number of interesting and some, I believe, perfectly new plants, among the latter being a ginger, balsam, and arum.

Many plants were observed that it was quite impossible to get at, but, on the whole, I made a very satisfactory collection. The ginger which I believe to be new and of which I only saw a single flower, although it had been flowering freely not long previously, grows in the chinks of the hardest rocks where it is impossible to get at the roots without blasting them out. I saw hundreds but only succeeded in getting about half-a-dozen, three of which I have sent to Kew. Of the balsam I dried a good series of specimens, and collected a nice lot of seeds, and of the arum tubers.

In one place I saw enormous clumps of *cypripedium*, but quite out of reach, and also a small growing *œrides* (*Ærides affine*). For miles round Kasum the virgin forest has all been destroyed by the paddy planters, and the present vegetation is composed largely of bamboos, of which three or four species are so abundant that they may be said to be the prevailing feature of the vegetation on all the low hills. In spite of this great destruction of forest, only sufficient rice for local consumption is produced, and the present price is about the same as in Penang. Fowls are abundant and cheap, costing only 6 or 7 cents each; but then these do not require much labour to raise.

A lazier lot of men it would be difficult to find, and the only thing that really livens them up is a cock-fight, then the village turns up like one man. Before going across to Pongah, I asked the Governor of Kasum to lend me a boat to return to Tongkah, but he said he had no suitable boat and that he always went in one of the Chinese tongkangs that come for fire-wood. He promised to arrange for me to go back in the same way, but when the time for starting came, the Chinaman said he had not enough wood yet, but perhaps he might go to-morrow or next day. To remain another day meant probably missing the *Petrel* and having to remain a week in Tongkah, so I begged them to find me a *prauh* of some sort, which they eventually did, and we got away on the ebb tide about 2 p.m. At about 7 p.m., we stopped at one of the islands for the men to eat, and they were inclined to stay there all night, but we got them on board and hoisted sail to a fair wind; one of the two men I took from Penang steering, and the other looking after the sail. None of the three men I got from Kasum were boatmen, and they did not understand sailing a boat. By 3 a.m., we had rounded Pulau Sirih, and were in sight of the Tongkah light, so that in returning with a fair wind, we did in 13 hours what it took 49 to do in going.

It was fortunate it did not rain either in going or returning, for we had no cover, not even a *kajang*. I had a whole day to spare in Tongkah, but there is not much to collect there unless one had time to go back to the wooded hills. There is no more sign of advancement here than in any of the other places. Everyone says that the population is diminishing rapidly. For every Chinaman that goes into Tongkah three or four come away."

Lankawi islands. This beautiful group of islands consists of the hilly island of Lankawi, Dayong Bonting and a number of smaller islets, while to the north lies the island of Terutau. The main island consists of granite and sandstones, at least for the larger part. Dayong Bonting, Terutau and many of the small islands are of limestone. In Dayong Bonting there is a deep lake of clear water, which appears to be formed by the entrance of a stream into a valley, the outlet to the sea being blocked by a limestone cliff through which probably the water escapes by an opening at the base. This lake contains an abundance of *Chara*. The lofty ridges of Gunong Chinchang (2413 feet) and Gunong Raya (2942 feet) are apparently of granite, but limestone is reported on the north face of the former which is a succession of sharp, high and precipitous peaks. The Geology of these islands would probably prove very interesting. The flora has been collected by Mr. Curtis, myself and Mohamed Haniff, but is very rich and remarkable, and many more plants yet unknown doubtless occur there. On the Main island is the village of Kwah on the sea shore where there is a rest house, shops, etc. This village seems to be increasing in size and the low land around it is being planted with coconuts and rubber, for the mania for rubber planting has reached even to these islands, and even the steep rocks are being cleared in parts for this plantation, which cannot be considered at all a suitable spot for a truly hygrophytic plant like *Hevea brasiliensis*.

The limestone flora. The main ranges of hills running north from Perlis, and part of the Lankawi islands are of limestone, white or grey. A quite similar rock runs down both sides of the Malay peninsula as far south as the Batu Caves of Kuala Lumpur, and probably originally further, as some years ago Mr. Machado showed me near Batu Pahat a spot where he had found limestone at some depth below the surface soil.

The limestone rock is not continuous south of Perlis on the west coast at least, but occurs in detached islands often of considerable altitude. It is extremely probable that they were formerly in most cases surrounded by sea. The flora of these southern outcrops of limestone while containing a good many plants of the Tenasserim flora, are largely now covered with plants of Malayan type which seem to have invaded them from the granitic woods. The limestone rocks which have been explored botanically in the south of the Peninsula are Batu Caves Selangor; Ipoh and neighbourhood; Gunong Pondok and Lenggong in Perak and Kota Glanggi, Pahang, East Coast. These show distinct traces of the northern Tenasserim flora, with such genera as *Calanthe* (*Preptanthe* section) *Trichoglottis*, *Cymaria* and several very distinct northern species such as *Livistona rupicola*, (Batu Caves) *Arisaema fimbriatum* (Kota Glanggi) *Amomum testaceum* (Batu Caves). As, however, the climate of these limestone rocks is very different from those of Perlis, there being no dry period, it is not to be wondered at that there are not more relics of the northern Perlis flora, adapted as most of it is for xerophytic regions. Mr. Scrivenor tells me that the age of this northern limestone is not known with certainty, but expects that it would be found to be Permo-carboniferous. The Geological story of this district would throw a good deal of light on the origin of the flora, but unfortunately it is not yet to hand.